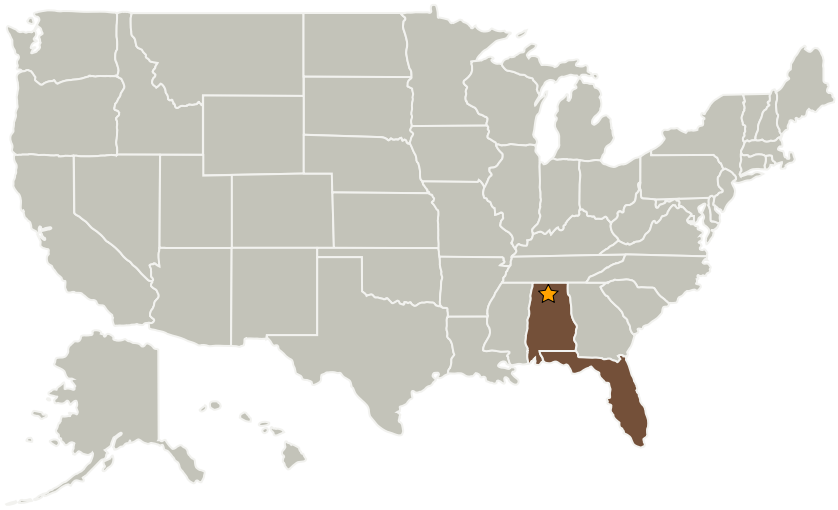
Vibration-Free Cooling Cycle Pump for Space Vehicles and Habitats, Phase II

Completed Technology Project (2006 - 2008)

Project Introduction

Mainstream Engineering Corporation completed the design of a high-speed pump for International Space Station (ISS) Environmental Control and Life Support Systems and future spacecraft and extraterrestrial outpost applications. Specifications for this pump were derived from an existing pump currently operating as part of the thermal control loop on the ISS. The design includes magnetic bearings so that a vibration-reducing control algorithm can be implemented. A digital controller was designed, which measured and reduced vibration-causing fluctuations in shaft displacement due to rotor unbalance in multiple axes. The controller was tested over an operating speed range of 600 to 7200 rpm with excellent results. The controller reduced mean shaft displacement by 71% over the entire operating range, and reduced it by more than 80% at higher operating speeds where synchronous vibration was dominant. In Phase II the magnetic bearing equipped cooling loop pump designed in Phase I will be fabricated and tested. Mainstream will demonstrate the added efficiency, reliability, and low vibration of the system as compared with the existing pump. The pump assembly will undergo vibration characterization testing with support from Marshall Space Flight Center.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Mainstream Engineering Corporation	Supporting Organization	Industry	Rockledge, Florida

Primary U.S. Work Locations	
Alabama	Florida

Project Transitions

December 2006: Project Start

November 2008: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.1 In-space Propellant Storage & Utilization